In the Claims

Please amend claims, as follows:

1 – 34. (Cancelled).

35. (Original) An HF coding method for coding, through a bandwidth extension scheme, an HF signal obtained from separation of a full-bandwidth sound signal into the HF signal and a LF signal, comprising:

performing an LPC analysis on the LF and HF signals to produce LPC coefficients which model a spectral envelope of the LF and HF signals;

calculating, from the LPC coefficients, an estimation of an HF matching gain;

calculating the energy of the HF signal;

processing the LF signal to produce a synthesized version of the HF signal;

calculating the energy of the synthesized version of the HF signal;

calculating a ratio between the calculated energy of the HF signal and the calculated energy of the synthesized version of the HF signal, and expressing the calculated ratio as an HF compensating gain; and

calculating a difference between the estimation of the HF matching gain and the HF compensating gain to obtain a gain correction;

wherein the coded HF signal comprises the LPC parameters and the gain correction.

36. . (Original) An HF coding method as defined in claim 35, wherein the HF signal is composed of frequency components higher than 6400 Hz.

37. . (Original) An HF coding method as defined in claim 35, further comprising:
converting the LPC coefficients to ISF coefficients; and
quantizing the ISF coefficients for transmission.

38. . (Original) An HF coding method as defined in claim 37, further comprising:
converting the quantized ISF coefficients to quantized ISP coefficients; and
converting the quantized ISP coefficients to quantized LPC coefficients.

39. . (Original) An HF coding method as defined in claim 35, wherein processing the LF signal to produce a synthesized version of the HF signal comprises:

filtering the LF signal through a quantized version of a LPC filter which models a spectral envelope of the HF signal to produce a residual signal; and

filtering the residual signal through a quantized HF synthesis filter to produce the synthesized version of the HF signal.

40. . (Original) An HF coding method as defined in claim 35, wherein:

- calculating the energy of the HF signal comprises:

filtering the HF signal through a HF perceptual filter; and

calculating the energy of the perceptually filtered HF signal; and

- calculating the energy of the synthesized version of the HF signal comprises:

filtering the synthesized version of the HF signal through a HF perceptual filter; and

calculating the energy of the perceptually filtered synthesized version of the HF signal.

41. . (Original) An HF coding method as defined in claim 35, wherein expressing the calculated ratio as a HF gain comprises:

expressing in dB the calculated ratio between the calculated energy of the HF signal and the calculated energy of the synthesized version of the HF signal.

41a. . (Original) An HF coding method as defined in claim 35, wherein calculating the HF matching gain comprises computing a ratio between the frequency responses of the LF LPC filter and the HF LPC filter at the Nyquist frequency.

42. . (Original) An HF coding method as defined in claim 35, wherein:

- performing an LPC analysis comprises computing HF quantized LPC coefficients $\hat{A}_{HF}(z)$; and

- calculating an estimation of an HF matching gain comprises:

computing 64 samples of a decaying sinusoid $h(n)$ at Nyquist frequency per sample by filtering a unit impulse $\delta(n)$ through a one-pole filter of the form $1/(1+0.9z^{-1})$;

filtering the decaying sinusoid $h(n)$ through a LF LPC filter $\hat{A}(z)$ to obtain a low-frequency residual, wherein $\hat{A}(z)$ represents LF quantized LPC coefficients from a LF coder;

filtering the filtered decaying sinusoid $h(n)$ through an HF LPC synthesis filter $1/\hat{A}_{HF}(z)$ to obtain a synthesis signal $x(n)$; and

computing a multiplicative inverse of the energy of the synthesis signal $x(n)$, and expressing it in the logarithmic domain, to produce a gain g_{match}; and

interpolating the gain g_{match} to produce the estimation of the HF matching gain.

43. . (Original) An HF coding method as defined in claim 35, comprising quantizing the gain correction to obtain a quantized gain correction.

44. . (Original) An HF coding device for coding, through a bandwidth extension scheme, an HF signal obtained from separation of a full-bandwidth sound signal into the HF signal and a LF signal, comprising:

means for performing an LPC analysis on the LF and HF signals to produce LPC coefficients which model a spectral envelope of the LF and HF signals;

means for calculating, from the LPC coefficients, an estimation of an HF matching gain;

means for calculating the energy of the HF signal;

means for processing the LF signal to produce a synthesized version of the HF signal;

means for calculating the energy of the synthesized version of the HF signal;

means for calculating a ratio between the calculated energy of the HF signal and the calculated energy of the synthesized version of the HF signal, and means for expressing the calculated ratio as an HF compensating gain; and

means for calculating a difference between the estimation of the HF matching gain and the HF compensating gain to obtain a gain correction;

wherein the coded HF signal comprises the LPC parameters and the gain correction.

45. . (Original) An HF coding device for coding, through a bandwidth extension scheme, an HF signal obtained from separation of a full-bandwidth sound signal into the HF signal and a LF signal, comprising:

an LPC analyzing means supplied with the LF and HF signals and producing, in response to the HF signal, LPC coefficients which model a spectral envelope of the LF and HF signals;

a calculator of an estimation of an matching HF gain in response to the LPC coefficients;

a calculator of the energy of the HF signal;

a filter supplied with the LF signal and producing, in response to the LF signal, a synthesized version of the HF signal;

a calculator of the energy of the synthesized version of the HF signal;

a calculator of a ratio between the calculated energy of the HF signal and the calculated energy of the synthesized version of the HF signal;

a converter supplied with the calculated ratio and expressing said calculated ratio as an HF compensating gain; and

a calculator of a difference between the estimation of the HF matching gain and the HF compensating gain to obtain a gain correction;

wherein the coded HF signal comprises the LPC parameters and the gain correction.

46. . (Original) An HF coding device as defined in claim 45, wherein the HF signal is composed of frequency components higher than 6400 Hz.

47. . (Original) An HF coding device as defined in claim 45, further comprising:

a converter of the LPC coefficients to ISF coefficients; and

a quantizer of the ISF coefficients.

48. . (Original) An HF coding device as defined in claim 47, further comprising:

a converter of the quantized ISF coefficients to quantized ISP coefficients; and

a converter of the quantized ISP coefficients to quantized LPC coefficients.

49. . (Original) An HF coding device as defined in claim 45, wherein the filter supplied with the LF signal and producing, in response to the LF signal, a synthesized version of the HF signal comprises:

a quantized LPC filter supplied with the LF signal and producing, in response to the LF signal, a residual signal; and

a quantized HF synthesis filter supplied with the residual signal and producing, in response to the residual signal, the synthesized version of the HF signal.

50. . (Original) An HF coding device as defined in claim 45, wherein:

- the calculator of the energy of the HF signal comprise:

a HF perceptual filter supplied with the HF signal; and

a calculator of the energy of the perceptually filtered HF signal; and

- the calculator of the energy of the synthesized version of the HF signal comprises:

a HF perceptual filter supplied with the synthesized version of the HF signal; and

a calculator of the energy of the perceptually filtered synthesized version of the HF signal.

51. . (Original) An HF coding device as defined in claim 45, wherein the converter expressing the calculated ratio as a HF gain comprises:

means for expressing in dB the calculated ratio between the calculated energy of the HF signal and the calculated energy of the synthesized version of the HF signal.

51a. . (Original) An HF coding device as defined in claim 55, wherein the calculator of the HF matching gain computes a ratio between the frequency responses of the LF LPC filter and the HF LPC filter at the Nyquist frequency.

52. An HF coding device as defined in claim 45, wherein:

- the LPC analyzer comprises a calculator of HF quantized LPC coefficients $\hat{A}_{HF}(z)$; and

- the calculator of an estimation of an HF matching gain comprises:

a calculator of 64 samples of a decaying sinusoid $h(n)$ at Nyquist frequency π radians per sample by filtering a unit impulse $\delta(n)$ through a one-pole filter of the form $1/(1+0.9z^{-1})$;

a LF LPC filter $\hat{A}(z)$ for filtering the decaying sinusoid $h(n)$ to obtain a low-frequency residual, wherein $\hat{A}(z)$ represents LF quantized LPC coefficients from a LF coder;

an HF LPC synthesis filter $1/\hat{A}_{HF}(z)$ for filtering the filtered decaying sinusoid $h(n)$ to obtain a synthesis signal $x(n)$; and

a calculator of a multiplicative inverse of the energy of the synthesis signal $x(n)$, and expressing it in the logarithmic domain, to produce a gain g_{match}; and

an interpolator of the gain g_{match} to produce the estimation of the HF matching gain.

53. . (Original) An HF coding device as defined in claim 45, comprising a quantizer of the gain correction to obtain a quantized gain correction.

54. . (Original) A method for decoding an HF signal coded through a bandwidth extension scheme, comprising:

receiving the coded HF signal;

extracting from the coded HF signal LPC coefficients and a gain correction;

calculating an estimation of the HF gain from the extracted LPC coefficients;

adding the gain correction to the calculated estimation of the HF gain to obtain an HF gain;

amplifying a LF excitation signal by the HF gain to produce a HF excitation signal; and

processing the HF excitation signal through a HF synthesis filter to produce a synthesized version of the HF signal.

55. . (Original) A method for decoding an HF signal as defined in claim 54, further comprising reducing buzziness of the HF excitation signal before supplying said HF excitation signal to the HF synthesis filter.

56. . (Original) A method for decoding an HF signal as defined in claim 54, wherein the HF synthesis filter is a HF linear-predictive synthesis filter.

57. . (Original) A method for decoding an HF signal as defined in claim 54, further comprising HF energy smoothing the synthesized version of the HF signal to smooth energy variations in said synthesized version of the HF signal.

58. . (Original) A method for decoding an HF signal as defined in claim 54, wherein extracting from the coded HF signal the LPC coefficients comprises:

decoding ISF coefficients from the coded HF signal;

converting the ISF coefficients to ISP coefficients;

interpolating the ISP coefficients; and

converting the interpolated ISP coefficients to quantized HF LPC coefficients.

59. . (Original) A method for decoding an HF signal as defined in claim 54, wherein:

- extracting LPC coefficients comprises extracting from the coded HF signal HF quantized LPC coefficients $\hat{A}_{HF}(z)$; and
- calculating an estimation of a HF gain comprises:

computing from the extracted LPC parameters ;

computing 64 samples of a decaying sinusoid $h(n)$ at Nyquist frequency π radians per sample by filtering a unit impulse $\delta(n)$ through a one-pole filter of the form $1/(1+0.9z^{-1})$;

filtering the decaying sinusoid $h(n)$ through a LF LPC filter $\hat{A}(z)$ to obtain a low-frequency residual, wherein $\hat{A}(z)$ represents LF quantized LPC coefficients from a LF decoder;

filtering the filtered decaying sinusoid $h(n)$ through an HF LPC synthesis filter $1/\hat{A}_{HF}(z)$ to obtain a synthesis signal $x(n)$; and

computing a multiplicative inverse of the energy of the synthesis signal $x(n)$, and expressing it in the logarithmic domain, to produce a gain g_{match}; and

interpolating the gain g_{match} to produce the estimation of the HF gain.

60. . (Original) A decoder for decoding an HF signal coded through a bandwidth extension scheme, comprising:

means for receiving the coded HF signal;

means for extracting from the coded HF signal LPC coefficients and a gain correction;

means for calculating an estimation of the HF gain from the extracted LPC coefficients;

means for adding the gain correction to the calculated estimation of the HF gain to obtain an HF gain;

means for amplifying a LF excitation signal by the HF gain to produce a HF excitation signal; and

means for processing the HF excitation signal through a HF synthesis filter to produce a synthesized version of the HF signal.

61. . (Original) A decoder for decoding an HF signal coded through a bandwidth extension scheme, comprising:

an input for receiving the coded HF signal;

a decoder supplied with the coded HF signal and extracting from the coded HF signal LPC coefficients;

a decoder supplied with the coded HF signal and extracting from the coded HF signal a gain correction;

a calculator of an estimation of the HF gain from the extracted LPC coefficients;

an adder of the gain correction and the calculated estimation of the HF gain to obtain an HF gain;

an amplifier of a LF excitation signal by the HF gain to produce a HF excitation signal; and

a HF synthesis filter supplied with the HF excitation signal and producing, in response to the HF excitation signal, a synthesized version of the HF signal.

62. . (Original) A decoder for decoding an HF signal as defined in claim 61, further comprising a buzziness reducer supplied with the HF excitation signal before supplying said HF excitation signal to the HF synthesis filter.

63. . (Original) A decoder for decoding an HF signal as defined in claim 61, wherein the HF synthesis filter is a HF linear-predictive synthesis filter.

64. . (Original) A decoder for decoding an HF signal as defined in claim 61, further comprising an HF energy smoothing module supplied with the synthesized version of the HF signal, the HF energy smoothing module smoothing energy variations in the synthesized version of the HF signal.

65. . (Original) A decoder for decoding an HF signal as defined in claim 61, wherein the decoder extracting from the coded HF signal the LPC coefficients comprises:

a decoder of ISF coefficients from the coded HF signal;

a converter the ISF coefficients to ISP coefficients;

an interpolator of the ISP coefficients; and

a converter of the interpolated ISP coefficients to quantized HF LPC coefficients.

66. . (Original) A decoder for decoding an HF signal as defined in claim 61, wherein:
- the decoder extracting LPC coefficients comprises an extractor of quantized LPC coefficients $\hat{A}_{HF}(z)$ from the coded HF signal; and
- the calculator of an estimation of the HF gain comprises:

a calculator of 64 samples of a decaying sinusoid $h(n)$ at Nyquist frequency π radians per sample by filtering a unit impulse $\delta(n)$ through a one-pole filter of the form $1/(1+0.9z^{-1})$;

a LF LPC filter $\hat{A}(z)$ for filtering the decaying sinusoid $h(n)$ to obtain a low-frequency residual, wherein $\hat{A}(z)$ represents LF quantized LPC coefficients from a LF decoder;

an HF LPC synthesis filter $1/\hat{A}_{HF}(z)$ for filtering the filtered decaying sinusoid $h(n)$ to obtain a synthesis signal $x(n)$; and

a calculator of a multiplicative inverse of the energy of the synthesis signal $x(n)$, and expressing it in the logarithmic domain, to produce a gain g_{match}; and

an interpolator of the gain g_{match} to produce the estimation of the HF gain.

67 – 92. (Cancelled).